

# **Appendix F**

## **Lockheed Martin Aeronautics – Palmdale**

### **Pilot Study Report**

California Environmental Protection Agency  
Environmental Management System Project

#### **1.0 Pilot Description**

Lockheed Martin Aeronautics Company is a leader in the design, development, systems integration, production, and support of advanced military aircraft. Rapid prototyping, simulation-based virtual design, and composite process development are just a few of the many engineering proficiencies that make this company preeminent in the aeronautics industry. The company's headquarters, which is also a major manufacturing operation, is located in Fort Worth, Texas with other major design and manufacturing sites in Marietta, Georgia, and Palmdale, California.

Lockheed Martin Aeronautics Company's site in Palmdale, California, is headquarters to the company's Advanced Development Programs (ADP), informally known as the "Skunk Works." It is also home to the U-2 high-altitude reconnaissance aircraft, upgrades and enhancements to the F-117 Nighthawk stealth attack aircraft, and C-130 special missions aircraft. It is located 80 miles north of Los Angeles in the Antelope Valley.

ADP began as a research and development operation in 1943 when the War Department asked heritage Lockheed to build a prototype jet fighter to counter the German jet fighters appearing in the air war over Europe. Lockheed's response was the P-80 Shooting Star. With that program, Lockheed set the standard for projects that are highly secret, very high priority, timely, and performed on a minimal budget.

The company went on to design, develop, and produce prototypes that became the U-2, SR-71 "Blackbird," and the F-117. All Lockheed Martin Aeronautics Company advanced development programs, such as electronic warfare simulation systems, detailed system/tactical simulation systems, and C4ISR hardware and software, are located in Palmdale. Approximately four thousand employees work at the Palmdale, California facility.

LM Aero – Palmdale marks 1992 as the beginning of their EMS; however, it was not until 1998 it was deemed compliant with the ISO 14001 EMS Standard. The EMS at LM Aero – Palmdale is mature; however, as Michael Haro, Environmental Manager at LM Aero – Palmdale said at the October 17, 2001 Cal/EPA Joint Working Group meeting in Oakland, maturity does not mean the

EMS is no longer growing or developing. Certification to the ISO 14001 Standard may be pursued at some later date.

### Pilot Project Management

LM Aero – Palmdale was selected to participate in the project in June 2000. Managing the pilot project for LM Aero – Palmdale is Michael Haro, Environmental Manager. Tom Lanphar, Senior Hazardous Substances Scientist for the Department of Toxic Substances Control is the Cal/EPA project manager.

### **History of Environmental Management at LM Aero-Palmdale**

LM Aero – Palmdale originated in Burbank, California during the Second World War as the Skunk Works. The creation of a Superfund Site in Burbank and serious environmental and health and safety violations in 1989 and 1990, resulting in over \$2.7 million in fines, motivated the company to develop a new system of environmental management at their new facility in Palmdale.

LM Aero's early EMS established environmental policies and focused on pollution prevention and compliance with environmental laws and regulations. Their current EMS combines occupational health aspects with environmental compliance and pollution prevention and is referred to as the Environmental, Safety and Health Management System (ESH-MS).

LM Aero – Palmdale has shown increasing commitment to EMSs. In 2000, Lockheed Martin established a new company by joining the Skunk Works in Palmdale with Lockheed Martin facilities in Fort Worth, Texas and Marietta, Georgia. As a result, LM Aero-Palmdale's EMS is again evolving as each of the three LM Aero facilities harmonizes their facility-level EMS into a single EMS for the entire company. Fort Worth's EMS has been certified by an accredited third party auditor. Palmdale may pursue third-party certification to the ISO 14001 standard as well. The transition to a new EMS has resulted in the need to create a new environmental policy statement, reevaluate aspects and impacts, set new objectives and targets, and develop new EMS procedures. The new elements of their EMS reflect the continuous improvement process that is integral to a highly functioning EMS.

## **2.0 Project Objectives**

The pilot project with LM Aero – Palmdale was conducted in order to meet the following objectives specified in AB 1102 (Stats. 1999, Ch. 65) codified in Public Resources Code, Section 71045 et seq.

**Objective 1** Whether and how the use of an environmental management system (EMS) by a regulated entity

increases public health and environmental protection over their current regulatory requirements<sup>1</sup>; and

**Objective 2** Whether and how the use of an EMS provides the public greater information on the nature and extent of public health and environmental effects than information provided by their current regulatory requirements<sup>2</sup>.

To the above, the Cal/EPA added the following objectives:

**Objective 3** Evaluate economic indicators to determine incentives and barriers to EMS implementation

**Objective 4** Identify challenges and successful examples of EMS implementation

Further, each pilot participant had one or more additional pilot specific objectives. The pilot specific objectives for the LM Aero-Palmdale were to:

**Objective 5** Determine whether and how an EMS can improve an existing pollution prevention program.

**Objective 6** Determine whether and how integrating occupational safety and health (OSH) programs into an EMS can improve both environmental and worker protection.<sup>3</sup>

In the following sections, each objective will be paraphrased. For example, Objective 1 is referred to as simply environmental protection. The term environmental protection is intended to capture protection of both environmental and public health.

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<sup>1</sup> Protection provided by current regulatory requirements is defined as those protections provided through the issuance, enforcement, and monitoring of any permit, requirement, authorization, standard, certification, or other approval issued by a federal, state, regional or local agency to the regulated entity for the protection of the public health or the environment (PRC § 71046(a)(1)).

<sup>2</sup> Information provided by current regulatory requirements is defined as that information provided through the issuance, enforcement, and monitoring of any permit, requirement, authorization, standard, certification, or other approval issued by a federal, state, regional or local agency to the regulated entity for the protection of the public health or the environment, or any other law or regulation governing the disclosure of public information (PRC § 71046(a)(2)).

<sup>3</sup> This objective, as originally written in the project work plan could not be met because no pollution prevention program existed prior to EMS implementation. Instead, this pilot project evaluated the relationship between EMS and pollution prevention.

### **3.0 Project Methodology**

LM Aero – Palmdale has contributed EMS data consistent with the National Database and the California Protocols. Three years of baseline data were submitted for the years 1996, 1997 and 1998. Two years of update data was submitted for 1999 and 2000. Although 1998 data was included in the baseline database; LM Aero considers 1998 the first year of full ISO 14001 EMS implementation. Another issue complicating data analysis is that LM Aero initiated their EMS in 1992, four years prior to the creation of the ISO 14001 standard. Strong initial performance improvement in areas like hazardous waste generation took place during the years 1992 to 1995. This data is not included in the national database; however, when relevant, the data will be discussed in this report. LM Aero – Palmdale collected all data submitted for this report.

In addition to the protocols, participants conducted site tours of their facilities for the Cal/EPA team. Cal/EPA team members also met with pilot participant staff to elicit specific information about the pilot facility.

The analysis is accomplished by evaluating changes in environmental protection and in the provision of environmental information to the public as a result of EMS implementation at LM Aero - Palmdale.

#### **3.1 Objective 1 Environmental Protection**

To determine whether and how improved environmental protection resulted from EMS implementation, the following three primary categories of information were evaluated.

1. Awareness and commitment
2. Systematic management of environmental impacts
3. Environmental performance indicators

*Awareness and Commitment* refers to the scope of environmental issues to which the organization devotes its attention, and identifies increased knowledge and understanding of environmental impacts, as well as recognition that action is necessary to lessen impacts and improve environmental protection.

Staff reviewed and analyzed the following measures of Awareness and Commitment:

1. The presence of an environmental policy which describes the organization's commitments and principles in regards to environmental protection.
2. Demonstrated knowledge and understanding of environmental laws, regulations, and other requirements.

3. Demonstrated knowledge and understanding of the environmental impacts of the organization.
4. Documentation of objectives and targets for environmental protection improvements.

*Systematic management of environmental impacts* refers to the ability of an organization to better protect the environment through a more mature and effective system of environmental management.

Staff reviewed and analyzed the following measures of systematic management for environmental protection:

1. Documented implementation strategies and responsibilities designed to meet regulatory requirements, manage significant aspects, and achieve objectives and targets for improved environmental protection.
2. Measures to assess environmental performance.
3. Audit and review processes to assess the performance of the management system and make system adjustments in order to continually improve environmental performance and protection.

*Environmental performance indicators* are the most quantitative and direct way of measuring changes in environmental protection. Key environmental indicators are the direct performance measure of an EMS. Examples include energy use, water use, solid and hazardous waste reduction, air emission, and quality of water discharge. An analysis of key environmental indicators provides information as to whether an EMS improves environmental protection.

Project staff reviewed and analyzed environmental data in the following areas to determine whether the EMS improved environmental protection.

1. Progress towards objectives and targets,
2. Pre and Post EMS Environmental Performance
3. Performance Beyond Regulatory Requirements
4. Compliance Performance

### **3.2 Objective 2 Environmental Information**

Staff analyzed the following two factors to determine whether and how an EMS provides greater environmental information to the public was accomplished.

1. The level of public and stakeholder involvement into the EMS development, implementation, and review; and

2. The level of improvements in the accessibility and quality of environmental information available to the public as a result of EMS implementation.

The level of public and stakeholder involvement into EMS development, implementation and review not only indicates changes in communication, it also indicates a changing stakeholder role in improving environmental protection. Involvement provides avenues for stakeholder response to environmental information and feedback to the organization on their performance. This indicator of greater environmental information is measured by evaluating actual stakeholder participation in the pilot's EMS and processes in the EMS for outside communication. This information was collected through the National Database, California Protocol and through Cal/EPA Project Manager's observations.

Improvements in the accessibility and quality of environmental information were evaluated using the California Protocols. Improvements in compliance with legal reporting requirements and information sharing beyond legal requirements indicate improved communication to the public. Accessibility and quality (timeliness, relevance, completeness, and credibility) is evaluated to determine whether the EMS results in greater information available to the public.

### **3.3 Objective 3 Economic Indicators**

Economic indicators provide an indication of economic costs and benefits of EMS implementation. Although determining economic impacts of EMS implementation is not a primary objective of the EMS Pilot Project, understanding these impacts is helpful in identifying incentives and barriers to EMS implementation. The economic data is analyzed to determine if the EMS provided savings incentives or increases in the costs of environmental management.

Limited information is available from LM Aero - Palmdale on economic indicators. The data was directly provided by the pilot and expresses the LM Aero – Palmdale's understanding of cost savings or cost increases as a result of EMS implementation.

### **3.4 Objective 4 Successes and Challenges of EMS Implementation**

Each pilot project offers unique experiences that provide lessons on the challenges inherent in the successful implementation of an EMS. These lessons help develop an understanding of the necessary or critical elements for successful EMS implementation. Challenges and successes were identified through the Cal/EPA and U.S. EPA Project Managers' observations, interviews with the LM Aero – Palmdale personnel and data analysis.

### **3.5 Objective 5 Evaluate the relationship between an EMS and a pollution prevention program.**

Understanding the relationship between an EMS and a pollution prevention program is accomplished by first identifying areas where the programs overlap and second by determining symbiotic benefits through data analysis, interviews and observations.

**3.6 Objective 6** Determine whether and how integrating occupational safety and health (OSH) programs into an EMS can improve both environmental and worker protection.

Understanding the environmental and safety benefits of an integrated environmental, safety and health management system is accomplished by first identifying areas where environmental and safety programs overlap and second by determining symbiotic benefits through data analysis, interviews and observations.

## **4.0 Discussion and Analysis**

### **4.1 Objective 1 Environmental Protection**

#### **Awareness and Commitment**

##### Environmental Policy

The LM Aero Company Environmental Policy applies to all three LM Aero facilities including Palmdale. Signed by Dain Hancock, President of LM Aero, the company policy establishes the environmental, health and safety policy of the organization and specifies roles and responsibilities. The policy employs active, present tense language in stating commitments. For example the policy states, "We:

- Prevent pollution, conserve resources, reduce waste and recover or recycle resources where economically feasible.
- Comply with applicable laws and regulations and satisfy corporate and customer requirements.
- Develop Environmental Safety and Health performance objectives and targets to ensure continual improvement of the Environment, Safety and Health Management System and reduce adverse ESH impacts."

LM Aero's EMS includes both environmental and safety and health issues and is referred to as their Environmental Safety and Health Management System. The environmental policy defines the scope of the EMS by emphasizing integration of Environmental Safety and Health (ESH) practices into all aspects of LM Aero's business. The policy specifically identifies ESH integration into the design processes to minimize adverse ESH impacts throughout production, use, and

disposal of products. Another broad inclusion into the EMS is the integration of ESH practices into procurement and property renovation, rearrangement, acquisition, consolidation and divestiture. The LM Aero environmental policy extends their EMS to include partnerships with regulatory agencies, customers, and suppliers to improve EHS performance and compliance cost effectiveness.

Responsibility for environmental safety and health is shared throughout the organization from senior management to program staff. The Environmental Policy commits to providing people, skill, technology, training, and budget to maintain an integrated EMS. They also commit to maintaining awareness of ESH requirements throughout the workforce.

LM Aero - Palmdale's Environmental Policy illustrates a significant change in awareness and commitment between the period prior to EMS implementation and the present. An Environmental Policy did not exist prior to EMS implementation and their pre-EMS environmental record discussed in Section 2.0 demonstrates a lack of awareness and commitment prior to EMS implementation. The Environmental Policy now expresses a commitment to environmental and worker protection and extends that commitment to every person in the organization. This commitment is not limited to meeting regulatory requirements but extends to unregulated activities. A key component of their Environmental Policy is the integration of ESH into all business functions. The policy also demonstrates a change in their awareness of environmental impacts to include the use of their products by customers and materials bought from suppliers. Maintaining the awareness of the workforce is an express commitment. The policy implies that a significant cultural change in the organization has resulted from EMS implementation. Whether this cultural change has actually occurred is evaluated in later sections of this report.

#### Knowledge and Understanding of Legal Requirements

LM Aero – Palmdale's compliance history prior to EMS implementation demonstrate shortcomings in their knowledge and understanding of legal requirements. Since establishing an EMS they have centrally cataloged all legal requirements and established information systems to disseminate that information to staff. By utilizing a corporate ESH web site, LM Aero—Palmdale employees are able to keep up with legal and other requirements. Updated weekly, the web site includes regulatory information, guidance modules, best practices, training documents, energy savings information, and industry standards. The web site receives over 1600 hits per day. LM Aero—Palmdale staff also maintain a Master Reports List that identifies all environmental reports, the agency involved with responsibility for report and the due date. This allows easy tracking of all environmental reporting requirements. The combination of the corporate EHS web site and the Master Reports Lists helps LM Aero – Palmdale employees maintain their knowledge of the legal requirements they



must meet. LM Aero – Palmdale’s training program helps ensure that the employees also understand the legal requirements.

### Knowledge and Understanding of Environmental Impact

An environmental aspect is an element of an organization’s activities, products, or services that can interact with the environment. Significant aspects are those aspects that have a significant impact on the environment and are determined by the organization based on self-established standard methodology. Management of all significant aspects is required by ISO 14001. Significant aspects are therefore a good indicator of awareness and commitment. Table 1 lists all significant aspects and impacts for LM Aero – Palmdale and whether the aspect relates to regulated or non-regulated impacts.

In its Environmental Policy LM Aero – Palmdale made a commitment to minimize significant environmental impacts. This will only occur if the organization knows and understands their aspects and associated impacts. LM Aero - Palmdale reported 23 Significant Aspects. Many of LM Aero – Palmdale aspects relates to hazardous materials management in their production operations. Every aspect except two, solid waste and land use/other resource uses, have one or more regulated impacts. Thirteen of the aspects have both regulated and non-regulated impacts. Nine aspects pertain only to regulated aspects. Table 1 demonstrates that LM Aero – Palmdale’s EMS is primarily focused on regulated aspects; however, some non-regulated aspects are also being managed. The only non-regulated aspects are solid waste, energy use, and land or other resource use. Also significant is the number of regulated aspects with non-regulated impacts demonstrating that not all impacts of a regulated activity are managed through regulation.

While the vast majority of aspects have direct impacts at or near their facility, one aspect, Customer Requirements, specifically relates to indirect impacts and the consideration of life cycle of LM Aero – Palmdale’s products. Aspects with impacts that are regional or global include solid and hazardous waste disposal, ozone depleting chemicals and energy consumption.

LM Aero – Palmdale’s procedure for determining whether an aspect has significant impact considers geographic scale of the impact. The impact’s consequence on local, regional, or global ecology is determined. Ranking of significant impacts into low, medium, or high risk demonstrates a greater understanding and awareness of the impacts of LM Aero – Palmdale’s activities.

LM Aero – Palmdale’s Environmental Policy is reflected in their aspect identification. Two unique aspects, real estate transactions and land use or other resource use relate to their Environmental Policy commitment to integrate ESH management practices into procurement and property renovation, rearrangement, acquisition, consolidation and divestiture.

The impact identification process of their EMS has added significant awareness of their environmental impacts. Prior to EMS implementation, no accounting system of major environmental impacts existed. In fact, LM Aero – Palmdale’s compliance history demonstrates that prior to EMS implementation in 1992, even regulated impacts were not adequately managed. While the majority of aspects are regulated, direct and local in nature, LM Aero – Palmdale does consider non-regulated, indirect and regional or global impacts when calculating significance of their aspects. The analysis of LM Aero – Palmdale’s aspects demonstrates that they are primarily focused on regulated impacts; however, some non-regulated aspects are recognized and therefore should be managed to reduce impacts.

#### Documentation of Objectives and Targets

Objectives and targets are listed on Table 2 and help demonstrate environmental commitments. The status of the objectives and targets, or the pilot’s progress towards these goals will be discussed later in Section 4.1.3 Environmental Performance Indicators.

LM Aero – Palmdale’s objectives and targets are both performance based and system based. Their performance-based objectives include 10% reductions in hazardous waste, solid waste, and occupational lost workdays. The objectives for hazardous waste and workdays reflect a striving for continual improvement in areas where considerable improvement has already been achieved. The solid waste objective also demonstrates a commitment to improve performance in a non-regulated area. Other objectives use performance at a particular level as the measure of achievement. Zero Notice of Violations, OSH Voluntary Protection status, ISO 14001 conformance, and the Superfund Amendments Reauthorization Act (SARA) Toxic Release Inventory (TRI) releases below thresholds are examples and demonstrate commitments to a high level of performance.

Two objectives relate to economic performance. These are the objectives to achieve the Lean Enterprise Goal of hazardous waste and to manage worker’s compensation programs to maintain zero cost growth. The Lean Enterprise Goal was to track costs savings from lower hazardous waste taxes, analytical costs and disposal cost of hazardous waste as a result of implementing waste reduction measures using a 1994 baseline.

Two system-based objectives are designed to establish environmental baseline and targets for energy/transportation related aspects and to develop and implement a common environmental technology task force to determine and prioritize P2 projects. The first of these two objectives identify movement towards managing and minimizing non-regulated aspects. The second objective illustrates the targeting of projects to address specific technological challenges.

Environmental Policy commitments are reflected in LM Aero – Palmdale’s objective and targets. The policy states that they will develop objectives and targets to ensure continual improvement of their EMS and reduce adverse impacts. The objectives and targets reflect their policy to maintain a safe workplace, comply with regulations, prevent pollution, and conserve resources. The significant aspects of hazardous waste, solid waste, and energy have related objectives. Absent are objectives for the significant aspect air emissions.

LM Aero – Palmdale’s objectives and targets demonstrate commitments to improve both regulated and non-regulated environmental aspects. The focus, however, is with regulated aspects. While performance for hazardous waste generation goes beyond regulatory requirements, they have not set objectives in excess of permitted emission standards for air or water. Their targets continue to address areas like hazardous waste and worker safety where significant progress has already been made. They are also establishing objectives in new areas like solid waste disposal, energy and transportation. LM Aero – Palmdale’s objectives and targets demonstrate a commitment to continually improve environmental protection in significant ways and to implement the Environmental Policy. Prior to EMS implementation in 1992, a system for setting environmental goals did not exist.

### **Systematic Management for Environmental Protection**

This section describes the actions taken by the organization as they relate to the implementation and review phases of the organization’s EMS and document how the organization protects the environment through its operations.

#### Documented Implementation Strategies and Responsibilities

In order to meet regulatory requirements, manage significant aspects and achieve objectives and targets LM Aero – Palmdale has implemented the following programs. The programs include implementation strategies and assign responsibility. Each of these programs is discussed in detail.

- Operational Controls
- Training Programs
- Employee Involvement and Communication
- Emergency Preparedness
- Compliance Assurance
- P2 Programs
- Health and Safety

#### *Operational Controls*

The purpose of operational controls in an EMS is to ensure that significant environmental aspects are managed in a way that is consistent with the environmental policy and so that the EMS objectives and targets for those

aspects are met. Two of the operational controls in place at LM Aero—Palmdale worth noting are the 6S Program and the chemical control program.

Manufacturing is responsible for the 6S Program; however, it has been a successful way of integrating ESH into manufacturing activities and meeting ESH policy and objectives. The six “S’s” are Sort, Straighten, Shine, Standardize, Sustain, and Safety. Originally developed in Japan as a manufacturing housekeeping and efficiency program called 5S, the 6S Program has been successfully applied at LM Aero—Palmdale to work more efficiently, reduce waste, conserve resources, prevent accidents and maintain compliance. The 6S programs helps implement the Environmental Policy commitment to maintain ESH requirement awareness throughout the workforce and execute tasks using safe, healthy, and environmentally sound practices. Sixty-one buildings and areas are audited 3-4 times per year and evaluated with a scorecard. Depending on the score, the areas are recognized as platinum, gold, silver, or bronze status. The 6S program has been an innovative and effective way to meet environmental, health and safety policies and objectives.

Chemical management and disposal are significant aspects at LM Aero—Palmdale and require extensive control. The major elements of the chemical control program involve the Chemical Control Board (CCB) and the chemical control cribs. The Chemical Control Board is made up of people from each department and therefore can initiate projects in every aspect of LM Aero – Palmdale’s operation and serve as a forum for department coordination. The Chemical Control Board identifies specific pollution prevention projects that are based on significant aspects and objectives identified in the EMS. In addition to pollution prevention projects, the CCB is responsible for approving all chemical purchases at LM Aero—Palmdale. Their review includes an analysis of the ESH risk involved with the chemical, the need for the chemical, and a search for less toxic alternatives. The CCB helps meet an Environmental Policy commitment to integrate environmental consideration into business decisions and design.

The daily use of chemicals is tracked and managed through a system of chemical control cribs. Chemical control cribs are locked areas distributed through out the Palmdale facility. A visit to one of the chemical control cribs was part of the EMS Working Group Tour of the LM Aero—Palmdale facility. The primary purpose of the chemical control cribs is to dispense chemicals and track their daily usage. The employee badge magnetic strip identifies the employee receiving the chemical. Each chemical package is given a bar code for identification. The package is weighed prior to leaving the crib, and the chemical is returned to the crib and weighed again at the end of the shift. This daily accounting allows LM Aero—Palmdale to meet the daily volatile organic compound (VOC) tracking requirements of the Antelope Valley Air Pollution Control District Rule 109, the Los Angeles County Fire Department requirement for reporting hazardous materials use, and other regulatory requirements for chemical tracking.

Internally, the package-by-package tracking of chemical use provides operational control. Combined with the approval process of the Chemical Control Board, the cribs ensure that no unauthorized chemicals are being used. The crib process also contributes to meeting pollution prevention goals. The accounting system reduces chemical usage and waste by ensuring that only necessary amounts of chemicals are provided to employees. This also has reduced the amount of chemicals that become waste due to shelf-life expiration.

The chemical identification system also allows for easy access of the Material Safety Data Sheet (MSDS) by the employees. By using the bar code on the chemical package, the MSDS can be obtained through the phone/fax system.

The chemical control board is an illustration of an EMS program that has successfully managed and controlled many significant environmental aspects as well as assisted in meeting pollution prevention and health and safety objectives. The chemical control board was not present prior to EMS implementation and is now an important element of the EMS.

#### *Training, Internal Communication and Employee Involvement*

Training, internal communication and employee involvement are highly integrated and therefore can not be discussed separately. These elements of LM Aero – Palmdale's EMS have evolved and improved over the years since EMS implementation in 1992.

The foundation of LM Aero – Palmdale's training program is the ESH Training Topics. The training program help implement the Environmental Policy commitments to provide people, specialized skills, technology, training, and budget to maintain an integrated EMS. Five separate tracks have been established for different job functions, these include operations, engineering/administration/office, laboratory, maintenance, and custodial. Each track receives one training per month. Most of the trainings are required by either environmental or health and safety requirements. Training on ISO 14001 compliance is included in each of the five tracks.

Another important communication and education program is the Job Hazard Analysis (JHA) program. A specific objective of the Pilot Project was to determine how the integration of environmental and occupational safety and health (OSH) programs into an EMS could benefit both. The JHA program demonstrates how a single program can have both environmental and health and safety benefits. The JHA has not only improved communication but has also increased knowledge of ESH impacts in the workplace. In 1998, LM Aero—Palmdale became involved in the California Occupational Safety and Health (Cal/OSHA) Voluntary Protection Program (VPP).

This program is an example of meeting their Environmental Policy commitment to pro-active partnerships with regulatory agencies. Participation in the VPP required that a more comprehensive evaluation of job hazards be conducted and that the hazards be communicated to employees. In order to satisfy the VPP requirements, LM Aero—Palmdale developed new procedures to evaluate both the environmental and worker safety for every major shop, lab, and work area. Inclusion of environmental hazards went beyond VPP requirements; however, this allowed ESH staff to evaluate all hazards, environmental and health and safety, at the plant. ISO 14001 also requires that every employee understand the potential and actual impacts of their job. The JHA helps LM Aero – Palmdale meet this requirement.

An *Environmental JHA Evaluation Form* was developed that identifies the location of the area being evaluated, the people responsible for the area and a general description of the processes in that area. A process flow chart is included to identify raw material inputs, processes, and waste or releases. A checklist identifies environmental release points, environmental controls, environmental aspects and source types. The last section of the form to be completed is the environmental risk section, in which the primary process hazard is identified and given a risk score. Probability of occurrence and severity are given a rating (1-low, 2-medium, or 3-high), and probability of detection is scored as 1-high, 2-medium, or 3-low. A total risk score is then given to the area. New environmental aspects are being identified using the Environmental JHA Evaluation Form and the risk scoring allows the ranking of significant aspects.

A *Safety and Health JHA Evaluation* is also completed for each area. The results of both the environmental and safety and health JHA evaluations are combined into a single product that lists all significant hazards in an area; environmental, safety and health controls; and training requirements for the work area. The completed JHA is given to the supervisor/manager of the area who must sign the form, post it in the affected area, and inform employees of the results.

The JHA has improved the quality of information going to employees by providing a “simple summary” of all the hazards of an area and what must be done to protect the worker and the environment. Traditionally, this type of information was provided through training or written policies and procedures organized by topic (air, water, or waste) instead of activity (job function).

The Job Hazard Analysis is an example of an integrated program that meets several objectives. It also demonstrates implementation LM Aero- Palmdale’s Environmental Policy Commitment to maintain EHS requirement awareness throughout the workforce and execute tasks using safe, healthy and environmentally sound work practices. Through the analysis, new environmental aspects and impacts can be identified as well as their risks and significance. The program also communicates valuable information to management and staff enabling them to work in a safer and more responsible manner. The JHA also

provides valuable information to ESH staff and contributes to the continual improvement process of their EMS. "You never stop learning about the factory and have to be aware of what goes on," says Michael Haro, Environmental Resources Manager. To date, JHAs have been completed for 55 buildings/areas.

Another means to communicate ESH issues to employees are the ESH Information Boards. These boards are posted in 25 buildings and include information on ESH resources, building emergency action plans, JHAs, ESH objectives, ESH alerts, employee injury and illness data, environmental metrics, and emergency phone numbers and contacts.

#### *Emergency Preparedness*

Although LM Aero—Palmdale is meeting the hazardous materials reporting requirements through their Hazardous Materials Business Plan they realized that more information on hazardous materials is available through their EMS. In order to provide emergency responders with this information and to alleviate fears regarding "secret" chemicals, LM Aero—Palmdale gave seven seminars to 135 personnel from LA County, Kern County and US Air Force Plant 42 Fire Departments. Regular plant tours are also given to the two closest fire stations. This is another example of pro-active partnerships LM Aero – Palmdale which LM Aero---Palmdale committed to in their Environmental Policy.

LM Aero—Palmdale is also exploring ways to connect with the fire departments through a Geographic Information System. This system would identify locations of chemicals and other hazards. LM Aero—Palmdale believes this would be a more useful product than the paper reports that they now submit.

#### *Compliance Assurance*

LM Aero – Palmdale's Environmental Policy stated that they comply with applicable laws and regulations. They have also expressed a yearly Zero Notice of Violation objective and target. In order to implement this policy and meet their objective, better systems for ensuring regulatory compliance are being utilized with the help of Information Technology (IT). By utilizing a corporate ESH web site, LM Aero—Palmdale employees are able to keep up with legal and other requirements. Updated weekly, the web site includes regulatory information, guidance modules, best practices, training documents, energy savings information, and industry standards. The web site receives over 1600 hits per day. LM Aero—Palmdale staff also maintain a Master Reports List that identifies all environmental reports, the agency involved with responsibility for the report and the due date. This allows easy tracking of all environmental reporting requirements.

They have also developed an extensive internal-audit scheme. A group within LM Aero called Process Integrity audits LM Aero – Palmdale against corporate requirements, the ISO 14001 standard and procedures related to environmental

compliance. Areas with highest risk are audited most frequently. These areas are determined through the EMS aspect analysis. Corrective action and root cause analysis is performed for any nonconformance. Process Integrity reports directly to the President of LM Aero.

#### *Health and Safety*

LM Aero – Palmdale integrates health and safety with environmental issues into a single EMS. Integration begins with the Environmental Policy where they make a commitment to maintaining a safe and health workplace to prevent injuries and illnesses. Health and safety issues are included in the EMS objectives and targets. The above discussion on training, communication and employee involvement also demonstrates how health and safety have been integrated into their EMS. The 6S program, also described above, is another program that integrates health and safety into the EMS. Many pollution prevention programs have health and safety benefits. These are described below. The performance measurement, audit and review processes are other ways LM Aero – Palmdale creates an integrated environmental, health and safety EMS.

A specific objective of the LM Aero – Palmdale pilot project was to determine how the integration of environmental and occupational safety and health (OSH) programs into an EMS could benefit both. The structure and systems approach of an EMS easily lends itself to continual improvement in worker protection.

The JHA and pollution prevention P2 programs demonstrate the natural overlap in environmental and health and safety issues. By integrating environment, health and safety into their EMS, LM Aero – Palmdale meet common objectives by single programs, rather than separate programs.

#### *Pollution Prevention Programs*

A specific objective of the LM Aero-Palmdale Pilot Project was to determine whether and how an EMS can improve an existing pollution prevention program. The objective, as written, cannot be addressed in that LM Aero – Palmdale program did not exist prior to EMS implementation in 1992. Pollution Prevention has been the guiding principle and foundation of their EMS since its inception. What LM Aero – Palmdale's EMS has demonstrated is that EMS and -pollution prevention are highly complementary and that the elements of an EMS like Environmental Policy, aspect/impact identification, objective setting, measurement, review and continual improvement all help performance of pollution prevention activities.

ISO 14001 requires that an Environmental Policy express a commitment to the prevention of pollution. This has created some controversy because it is understood that prevention of pollution could include control technologies, while pollution prevention seeks to eliminate pollution by not creating the pollution in the first place. The LM Aero – Palmdale Environmental Policy is an example of a policy that goes beyond an express commitment to the prevention of pollution and specifically includes pollution prevention principles like resource



conservation, waste reduction, resource recovery and recycling, and integrating ESH management practices into business decisions and the design process.

The setting of objectives and targets has been an effective tool for driving pollution prevention performance. Even after reducing hazardous waste generation 91 percent between 1991 and 2000, LM Aero – Palmdale has set and met an additional 10 percent reduction for 2001.

EMS processes for performance measurement and review by senior management have helped establish pollution prevention as a management priority and keeps senior management informed on issues and progress.

LM Aero – Palmdale has successfully integrated pollution prevention into business decisions, design process, and daily practices of its workers by implementing programs such as training and communication, 6S, and the Job Hazard Analysis. The Chemical Control Board discussed earlier as an operational control is the primary group responsible for Pollution Prevention projects. The Board is made up of people from each department and therefore can initiate projects in every aspect of LM Aero – Palmdale's operation and serve as a forum for department coordination. The Chemical Control Board identifies specific pollution prevention projects that are based on significant aspects and objectives identified in the EMS.

A specific example of pollution prevention integration into business and design processes is the Joint Strike Fighter (JSF). Pollution prevention was considered from the initial design discussions, and pollution prevention technologies developed for the F-117A Stealth Fighter, F-16, and F-22 were incorporated into the design of the JSF. Only fifty-four hazardous materials are used to support the JSF concept demonstrator aircraft, whereas four to five hundred hazardous materials are typically found in predecessor production aircraft.

One potential JSF project will be to demonstrate the use of a paint-less topcoat. Made of 100% resin solids, the film totally eliminates VOCs from the manufacturing process. The paint-less topcoat has been successfully tested on an F-16 and a C-130. Using the paint-less topcoat could mean a \$3 billion savings over the life of the project. Other environmental projects of the JSF include no ozone depleting chemicals, chrome free fuel tank sealant, no hydraulic oils (electronic actuators), and no oxygen bottles--oxygen is taken from the atmosphere.

LM Aero – Palmdale's external communication program has also included pollution prevention projects. A pollution prevention fair held in 1999 sought to expose local businesses to pollution prevention technologies used at LM Aero and help businesses explore pollution prevention technologies for themselves.

#### Measure to Assess Environmental Performance

LM Aero – Palmdale’s primary indicators of environmental performance are total and production related hazardous waste disposal, volatile organic compound (VOC) emissions, solid waste disposal, 6S program awards, and Days Away Case Rate (an indicator of lost work days due to on the job accidents). They also monitor permitted emissions for water and air. The Environmental Safety and Health staff is responsible for measurement. Measurement is an important part of the EMS. Measurements are related to EMS objectives as well as compliance requirements. There is no indication that measurements exceed regulatory requirements. According to Michael Haro, prior to EMS implementation, management was unaware of any environmental performance metrics, including hazardous waste generation. Performance is now reviewed weekly through weekly highlights and staff meetings and through monthly ESH Performance Reports.

#### Audit and Review Processes for Continual Improvement

Continual improvement of an EMS is not possible without the ability to check how the system is operating and take corrective actions to improve the system. A series of internal and corporate audits review compliance with regulatory and corporate requirements and procedures. These audits also check the resilience of the EMS. The review system includes:

- Biannual environmental inspections,
- Annual ESH Records and ESH Management System review,
- Annual Safety and Health inspections of all buildings,
- Monthly Building Manager Inspections,
- Correction Notice System for tracking corrective action,
- Biannual Senior Management Review,
- Annual US Air Force ESH Reviews at Plant 42,
- Corporate ESH Reviews every 3 years,
- Preventative Maintenance System (equipment checking), and
- Process Integrity Review Program (new system).

The results of the reviews, inspections, audits and performance measurements are reported to management in a series of meetings and reports that involve management at various levels. Senior management receives weekly, monthly and quarterly reports. Weekly Environmental Safety and Health Managers and staff review accomplishments, performance and compliance issues. Weekly highlights are generated at this meeting and sent to senior management. Senior management also receive monthly Environmental Safety and Health Performance reports and include safety and health injuries, waste disposal, inspection results, and other significant events. Quarterly Performance Summary

Reports are generated and report self-assessment and inspection reports and performance measures. The President of LM Aero receives nonconformance reports as well as Process Integrity Reports. Nonconformance reports address adherence to regulatory, corporate and customer requirements. Process Integrity Reports communicate findings of internal audits to the President. The audits cover LM Aero procedures and ISO 14001 requirements.

LM Aero – Palmdale’s system for review and continual improvement has evolved with the development of their EMS. Prior to EMS implementation senior management was not aware of the amount of hazardous waste generated by the company. LM Aero – Palmdale now requires that root cause analysis and corrective action be conducted for any nonconformance identified in an audit or review. A root cause analysis is a process whereby the cause of a particular accident or non-compliance is determined. Through this process LM Aero – Palmdale identifies issues and directs corrections to continually improve their EMS. Also, involving senior management and the President in the EMS review helps meet an Environmental Policy commitment to integrate EHS management practices into business decisions. Further, senior management establishes new objectives and targets based on information provided in the reviews. Meeting these objectives and targets is now tied to economic compensation in the form of bonuses and merit pay increases for management.

### **Environmental Performance Indicators**

This section describes actual environmental performance of the pilot project during the study period. Progress towards objectives and targets, environmental performance indicators, performance compared to regulatory requirements, and compliance history is analyzed to determine whether LM Aero – Palmdale’s EMS has improved environmental protection.

#### Progress towards Objective and Targets, Table 2

The status column in Table 2 describes the progress made towards objectives and targets. LM Aero – Palmdale has seen good success in meeting most of its objectives.

#### Pre and post EMS Environmental Performance, Table 3

Actual improvements in environmental protection are best illustrated through environmental performance indicators. Table 3 lists environmental performance for key indicators for the years 1996 through 2000. This data was collected using the University of North Carolina (UNC) National Database. Although LM Aero – Palmdale self declared compliance with the ISO 14001 Standard in 1998, this year’s data is included with the baseline data. Further, LM Aero – Palmdale’s EMS was in place and evolving during baseline years 1996 and 1997. In fact, LM Aero – Palmdale’s early EMS dates back to 1992; therefore, a more

appropriate baseline for some indicators may in fact be 1991. The primary data collected for this pilot project is the UNC database. The data years 1996 to 2000 were selected in order to provide more recent data on EMS performance. Where appropriate, data from earlier years will be discussed in this report.

Hazardous waste generation at LM Aero – Palmdale has been a focus of their EMS from its earliest beginnings. Implementation of their EMS has had a tremendous effect on the amount of hazardous waste generated. From 1996 to 2000, total hazardous waste generation was reduced from 1,084,000 lbs. to 628,000 pounds, or a 42 percent reduction. Normalizing the data to per employees translates to a 26 percent reduction over those years. When compared to the 1991 baseline of 7,384,000 pounds the reduction equals a 91 percent reduction in hazardous waste generation.

Production related hazardous waste refers to waste only generated by production processes. It does not include, for example, one-time wastes including underground storage tank removal waste, PCB (polychlorinated byphenels) oil from transformer replacement, or asbestos abatement due to building renovation. The indicator is therefore, a good measure of hazardous waste generation from normal activities.

Production related hazardous waste, including both RCRA and California only waste, declined from 701,889 pounds in 1996 to 528,000 pounds in 2000, or roughly 25 percent. When this data is normalized per employees, the results are less significant (129 pounds per employee in 1996 compared to 124 pounds per employees in 2000). The normalized results reflect a 21 percent reduction of the workforce during that period. Therefore one might conclude that the reduction was mainly due to reduced production. However, to better understand production related hazardous waste reduction each waste stream, RCRA and California only must be analyzed. When each individual production waste stream is looked at separately a clearer picture of LM Aero – Palmdale's waste reduction successes and challenges are seen.

LM Aero – Palmdale's largest waste stream is production trash, a California only waste. Production trash includes personal protection equipment (PPE) and containers. Because of the type of materials used by Palmdale, especially sticky composite materials like resins, LM Aero – Palmdale can not meet California's empty container regulations. These empty containers make up much of the production trash. As a result, LM Aero – Palmdale has not been able to affect the amount of California only waste through pollution prevention initiative. In fact this waste stream has increased. During the period 1996 to 2000 California only waste increased from 298,167 pounds in 1996 to 387,140 pounds in 2000, or 23 percent. California only hazardous waste remains a technical barrier to waste reduction and a pollution prevention challenge.

During that same time, Resource Conservation and Recovery Act (RCRA) production hazardous waste was reduced by 65 percent, from 403,722 pounds to 140,860 pounds. Per employee this represents a 45 percent reduction. LM Aero recently decided to track RCRA production hazardous waste separately so that an “apples-to-apples” comparison could be made across the three facilities in Texas, Georgia and California. In these other states production trash is discarded in the solid waste stream.

A comparison of RCRA and California only hazardous waste indicates that LM Aero – Palmdale has been more successful in implementing pollution prevention activities for RCRA waste than California only waste. Between 1996 and 2000 California only waste has actually increased by 23 percent while employment decreased by 21 percent. RCRA waste during the same period was reduced by 65 percent. Employment figures, while a useful indicator of production activity, does not appear to be the single influence of waste reduction indicators. Other factors, like the implementation of the 6S program, may also affect hazardous waste generation.

Volatile Organic Compounds (VOC) emissions to the air are another indicator of the LM Aero – Palmdale’s environmental performance. Large reductions in VOC emissions were seen in the early 1990’s. These represent a transition from organic degreasers to primarily aqueous cleaners. In 1990, the Skunk Works facilities in Palmdale and Burbank generated 256,000 pounds of VOC combined. By 1991, that figure had been reduced to 103,000 pounds. The reduction was a result of shutting down a perchlorethylene vapor degreaser in Burbank and switching to 1,1,1-trichloroethane (a non-VOC solvent but ozone depletor). The 1,1,1-trichloroethane vapor degreaser was then shut down in 1994 (to reduce ozone depleting chemical emissions) when a switch was made to only aqueous degreasers.

According to Michael Haro, Manager of Environmental Resources LM Aero – Palmdale, these were intentional pollution prevention steps to reduce pollution and were not driven by regulatory changes. Although highly toxic and a major contributor to smog, use of perchlorethylene is still acceptable under Antelope Valley Air Pollution Control District (AVAPCD) Rule 1122. This same rule exempts 1,1,1-trichlorethane from regulation.

Since 1994, VOC emissions have fluctuated with a low of 35,691 pounds in 1997. VOC emissions for the year 2000 were at 49,286 pounds. This actually represents a 50 percent increase in VOC emissions per 100 employees from the 1996 baseline year. LM Aero – Palmdale’s inability to affect VOC performance post 1994 is a reflection of technical barriers and the nature of LM Aero – Palmdale’s operations. Aircraft painting generates much of the VOC emissions and although the number of personnel has stayed relatively constant, the number and size of aircraft varies greatly each year. Finding less polluting substitutes is also difficult because LM Aero must meet military specifications. Because of

these difficulties, LM Aero – Palmdale had not set VOC objectives in the past; however, their 2001 EMS established the Environmental Aspect Risk Reduction Initiative. This initiative targets specific processes, rather than numeric performance objectives. For example, in 2001 LM Aero – Palmdale set a new objective to eliminate the use of Methyl Ethyl Ketone (MEK). They are also experimenting with a non-VOC topcoat for the Joint Strike Fighter. In this way LM Aero – Palmdale will target one material at a time rather than setting numeric performance objectives.

Solid Waste disposal values have increased over the study period. In 1996, LM Aero – Palmdale generated 855 tons, or 314 pounds per 100 employees. This figure increased to 1,542 tons or 548 pounds per 100 employees in 1998. In 2000, solid waste generation was at 1,104 tons, or 518 pounds per 100 employees. The high levels of solid waste generation in 1998, 1999 and 2000 as compared to 1996 may be attributed to the implementation of the 6S program, a major housekeeping program that sought to eliminate clutter and unneeded material. Solid waste is another aspect that while being managed through the EMS it was only in 2000 that specific targets and objectives were set. LM Aero – Palmdale's 6S program (Sort, Straighten, Shine, Standardize, Sustain and Safety) is an example of a leading indicator of environmental performance as it reflects employee practices in the areas of safety and general housekeeping, a basic pollution prevention technique. The 6S program awards groups or areas for their work practices. The rating system includes five different levels. In 1999, the first year of the program LM Aero – Palmdale awarded 4 platinum, 4 gold, 7 silver, 14 bronze and 29 satisfactory ratings. In 2000, they awarded 22 platinum, 5 gold, 5 silver, 10 bronze and 8 satisfactory ratings. The safety and housekeeping practices encouraged through the 6S program should reduce the amount of accidents, spills and waste by making employees more efficient and eliminating potential hazards in the work place. The 6S program integrates environmental and employee protection for the benefits of both.

LM Aero – Palmdale's EMS includes environmental, health and safety. Days Away Case Rate (DACR) measures the rate of lost workday cases, which typically represents the more serious injuries. This figure has steadily decreased from 1.28 lost workday cases per 100 employees in 1996 to 0.88 lost workday cases per 100 in 2000. In 1995, the year prior to our first baseline year DACR was 2.33 per 100 employees. The 2000 figure represents a 66 percent reduction from 1995 levels. LM Aero – Palmdale set a 2001 objective to achieve a lost work day incident rate [not DACR] reduction of 10 percent compared to 2000. LM Aero – Palmdale achieved 50% reduction primarily due to implementation of new return-to-work program. The return-to-work committee was able to bring employees back to work in record time, performing modified duty.

#### Performance beyond Regulatory Requirements, Table 4

LM Aero – Palmdale has consistently performed within regulatory requirements during the study period. Air emissions and water discharge are the only regulated emissions at LM Aero – Palmdale. No specific performance objective and target has been set for these two media, except to maintain compliance and not receive any Notice of Violations. In 1998, their permitted water discharge limits were drastically reduced, however, LM Aero – Palmdale emissions met these new standards for all years of the study period (1996-2000). LM Aero – Palmdale's VOC emissions are significantly below their regulatory level of 114 tons per year. During the year 2000, the year with the highest VOC emissions during our study period, LM Aero's VOCs emissions were 78 percent below the allowable permitted level.

#### Compliance Performance, Table 5

LM Aero – Palmdale's Environmental Policy expresses a commitment to comply with applicable laws and regulations. They have also set a yearly objective of zero Notice of Violations. During the study period LM Aero – Palmdale did experience a few minor regulatory non-compliances. In 1998, the Los Angeles County Sanitation District cited LM Aero – Palmdale for a single chrome exceedence in their discharge. LM Aero – Palmdale was not able to identify the source of the chrome and no fines were levied. They were also cited by the California Department of Health Services for detected coliform in a water well. A contractor who failed to de-contaminate the well cover caused the problem. Again, no fines were levied. An incorrect water sampling method was the cause of their only non-compliance in 2000. A 24-hour composite sample was collected instead of a grab sample and resulted in sulfides building up in the wastewater sample. Notices of Violations were not issued for these occurrences, nor were any fines.

These non-compliances are insignificant compared to the pre-EMS compliance history. In 1989, the Skunk Works was fined \$1.5 million by OSHA and \$1 million by the South Coast Air Quality District. The California Department of Toxic Substances Control levied a \$50,000 fine for hazardous waste violations in 1990. That same year, the US Environmental Protection Agency issued a \$400,000 fine.

## **4.2 Objective 2      Environmental Information**

### **Public and Stakeholder Involvement in the EMS Development, Implementation and Review**

Two commitments expressed in LM Aero – Palmdale's Environmental Policy relate to stakeholder involvement, these are:

- Respond to employee, community, customer, and regulatory agency concerns regarding potential adverse EHS impacts due to LM Aero activities, products or services; and
- Establish pro-active partnerships with regulatory agencies, customers, and suppliers to improve EHS performance and compliance costs effectiveness.

In responding to these commitments, LM Aero – Palmdale has participated in the Cal/EPA stakeholder-working group and established their own local stakeholder group. These are described below.

Cal/EPA established stakeholder Working Groups in both Southern and Northern California. Participation in one of those working groups was a requirement of inclusion into the pilot project. Working Groups were established to enlist stakeholder involvement and advice in meeting the objectives of the Cal/EPA pilot project as well as to provide a forum for stakeholder input into the pilot's EMS. Although pilot project participation with stakeholders through the Working Group was a project requirement, the experience of LM Aero – Palmdale in this setting can provide information as to the willingness of parties to work together as well as the value of that relationship. LM Aero - Palmdale participated on the Southern California Working Group and hosted an on-site meeting and facility tour in January 2001. During this meeting, LM Aero – Palmdale shared extensive detail about their EMS including their Environmental Policy, aspect and impact identification, objectives and targets, environmental performance and programs such as training and communication, emergency preparedness, pollution prevention, operational controls, management review and corrective action.

The Southern California Working Group gained significant understanding of a mature and effective EMS through LM Aero – Palmdale's participation within the group. This information increased stakeholders' understanding of the potential environmental benefits of EMS implementation as well as knowledge of how an EMS is actually created and implemented. The relationship therefore mainly served to increase stakeholder knowledge of the environmental impacts and systems for managing those impacts, rather than the stakeholders influencing LM Aero – Palmdale's EMS. Another forum created by LM Aero – Palmdale, the Community Stakeholder Environmental Roundtable, has involved local stakeholders more in the development of their EMS.

Begun in 1997, the Community Stakeholder Environmental Roundtable meets yearly to review environmental, safety and health performance and provide input on the continued implementation of LM Aero – Palmdale's EMS. The Roundtable includes local regulators as well as environmental groups such as the Desert Citizens Against Toxics.



The Community Stakeholder Environmental Roundtable has also served to improve relationships within the Antelope Valley. The yearly meeting and plant visits have resulted in joint projects including an Antelope Valley Pollution Prevention Fair. LM Aero—Palmdale also co-hosted several household hazardous waste roundups with Los Angeles County Sanitation District.

Community projects with the local schools are another form of outreach and communication. ESH staff have visited science classes and participated in science fairs. LM Aero—Palmdale also sponsors teachers to attend the Key Issues Institute in Colorado where teachers learn how to develop environmental curriculums that focus on local issues.

The Roundtable has been successful in providing environmental information to the community on both LM Aero – Palmdale operations as well as general environmental information that may be helpful in improving the well being of the community. The Roundtable is a direct outgrowth of LM Aero– Palmdale’s EMS.

### **Public Accessibility and Quality of Environmental Information**

Table 6 identifies environmental information type and availability to the public. This information was collected to determine if greater environmental information was available to the public than that which is required by law and regulation. A significant amount of information on LM Aero – Palmdale’s EMS is publicly available. Legally required information provided by LM Aero – Palmdale includes compliance information, hazardous waste generation, air emissions, water discharge, Toxic Release Inventory, Community Right to Know, and Prop. 65. This information is primarily available at an environmental agency; however, the information is also shared with the Community Roundtable and the EMS Working Group. Information about LM Aero – Palmdale’s EMS, like the Environmental Policy, significant aspects, objectives and targets and EMS programs is also shared with the Community Roundtable and the EMS Working Group. Some environmental information is included on LM Aero – Palmdale’s web site including hazardous waste generation, Toxic Release Inventory, workers lost workdays, pollution prevention, and pollution control technology. The most recent data included on the web site is for the year 2000.

An assessment of LM Aero – Palmdale’s community right to know information for emergency response providers identified weaknesses in the accessibility of critical information. Information on hazardous materials types and location are reported through their Hazardous Materials Business Plan. This large paper inventory report may not be readily accessible to first responders in a timely manner. Further, misinformation on rumors of “secret” chemicals raised fears amongst local fire fighters. In response, LM Aero—Palmdale gave seven seminars to 135 personnel from LA County, Kern County and US Air Force Plant

42 Fire Departments. Regular plant tours are also given to the two closest fire stations. LM Aero—Palmdale is also exploring ways to connect with the fire departments through a Geographic Information System. This system would provide electronic information on the location of chemicals and other hazards. LM Aero—Palmdale believes this would be a more useful product than the paper reports that they now submit.

Improvements in environmental information to the public have primarily occurred through the involvement of stakeholder groups. These groups are given the most complete and recent information on environmental issues; however, they meet infrequently. Direct involvement of emergency response personnel has improved information to public agencies. Limited environmental information has been shared through the Internet although this information is over a year old. The type of information generated by LM Aero – Palmdale's EMS is extensive and relevant to the public. Sharing this information in a timely manner and in a way that is most accessible is a challenge.

#### **4.3 Objective 3      Economic Incentives and Barriers to EMS Implementation**

Economic indicators provide an indication of economic costs and benefits of EMS implementation. Although determining economic impacts of EMS implementation is not a primary objective of the EMS Pilot Project, understanding these impacts is helpful in identifying incentives and barriers to EMS implementation. LM Aero – Palmdale has provided aggregate economic data.

Although difficult to specifically attribute to its EMS, LM Aero – Palmdale has reduced its annual environmental program costs (i.e., costs for waste disposal, air and water treatment systems, laboratory analysis, and environmental fees and taxes) by over \$1 million (or 54%) between 1992 and 1999. These costs went from \$2,157,000 in 1992 to \$1,057,000 in 2000 for a total saving of \$7,249,000.

LM Aero – Palmdale has emphasized economic performance in their EMS. Economic feasibility is a stated requirement in their Environmental Policy in order to prevent pollution, conserve resources, reduce waste, and recover or recycle resources. Economic performance is also included in two of their EMS objectives. LM Aero – Palmdale set out to save \$2.1 million in environmental costs between 1996 and 1996 by establishing the Lean Enterprise Goal. Using a 1994 baseline cost savings in 96, 97, 98 and 99 totaled \$2,281,953. A goal to manage worker's compensation programs to maintain zero cost growth in spite of increasing provider and indemnity rates was not successful. Total costs increased 73 percent over 2000 due to a single expensive non-occupational claim. The cost savings reported by LM Aero – Palmdale and their performance towards goals demonstrates that environmental protection and costs effectiveness are not mutually exclusive.

#### **4.4 Objective 4** Successes and Challenges of EMS Implementation

When LM Aero – Palmdale set out to establish an EMS in 1992, they were highly motivated not to repeat the mistakes that resulted in serious environmental violations and fines of \$2.7 million. Their customers, primarily the federal government, were also interested in better environmental performance in the products they purchased and from the companies that created them. These forces motivated LM Aero – Palmdale to establish a new system for environmental management. This motivation created strong commitment for change from senior management at Lockheed Corporation and at LM Aero – Palmdale. The commitment was translated into personnel and resources needed to create a successful EMS.

LM Aero – Palmdale’s ability to integrate EMS and its philosophies into every aspect of their business has greatly contributed to its success. Stressing that environmental health and safety is everyone’s responsibility has helped make the integration successful. The Environmental Policy firmly establishes LM Aero - Palmdale’s commitment to integration. According to Michael Haro, Manager of Environmental Resources, “Integration is about making environmental, health and safety real for everybody else in the company.” Establishing specific programs like the 6S program and Job Hazard Analysis has helped institutionalize EMS integration. The Joint Strike Fighter is an example of successful integration of pollution prevention concepts in product development and design.

#### **4.5 Objective 5** Evaluate the relationship between an EMS a pollution prevention program.

The project demonstrated the complementary nature of EMS and pollution prevention programs. Pollution prevention has been the guiding principle and foundation of LM Aero – Palmdale’s EMS since its inception. The LM Aero – Palmdale’s EMS has demonstrated that EMS and pollution prevention are highly complementary and that the elements of an EMS like environmental policy, aspect/impact identification, objective setting, measurement, review and continual improvement all help performance of pollution prevention activities.

ISO 14001 requires that an environmental policy express a commitment to the prevention of pollution. This has created some controversy because it is understood that prevention of pollution could include control technologies, while pollution prevention seeks to eliminate pollution by not creating the pollution in the first place. The LM Aero – Palmdale Environmental Policy is an example of a policy that goes beyond an express commitment to the prevention of pollution and specifically includes pollution prevention principles like resource conservation, waste reduction, resource recovery and recycling and integrating ESH management practices into business decisions and the design process.

The setting of objectives and targets has been an effective tool for driving pollution prevention performance. Even after reducing hazardous waste generation 91 percent between 1991 and 2000, LM Aero – Palmdale has set and met an additional 10 percent reduction for 2001. EMS processes for performance measurement, as well as review by senior management have helped establish pollution prevention as a management priority and also keep them informed on issues and progress.

**4.6 Objective 6** Determine whether and how integrating occupational safety and health (OSH) programs into an EMS can improve both environmental and worker protection.

The LM Aero – Palmdale project demonstrates the symbiotic relationship between environment and health and safety programs and an integrated EMS. The structure and systems approach of an EMS easily lends itself to continual improvement in worker protection. A commitment to maintain a safe and healthy workplace is included in their Environmental Policy. Performance objectives and metrics for worker safety are included in the EMS. The audit and review processes inform senior management of performance and result in corrective action and improvement. Many issues addressed by the EMS have both environmental and worker health impacts. Combined programs like 6S and Job Hazard Analysis have efficiently and successfully addressed both issues. Pollution prevention projects almost always have had environmental as well as worker safety benefits. Combining the issues has also helped communicate the importance of responsible behavior and improved staffs buy in for the programs. By integrating environment, health and safety into their EMS, LM Aero – Palmdale meets common objectives by single programs, rather than separate programs.

## **5.0 Findings**

### **5.1 Objective 1 Environmental Protection**

- LM Aero - Palmdale's Environmental Policy illustrates a significant change in awareness and commitment when comparing the period prior to EMS implementation to the present. An Environmental Policy or an expressed commitment to environmental protection did not exist prior to EMS implementation. This commitment includes both regulatory requirements and unregulated activities. The Environmental Policy also demonstrates increased awareness of environmental issues by including both regulated and non-regulated impacts in the scope of the EMS and emphasizing the integration of environmental, safety and health into all business functions. Maintaining environmental, safety and health requirement awareness throughout the workforce is an expressed commitment in their policy. The policy implies that a significant cultural change in the organization has resulted from EMS implementation.

- LM Aero – Palmdale’s compliance history prior to EMS implementation demonstrates shortcomings in their knowledge and understanding of legal requirements. Since establishing an EMS, they have centrally catalogued all legal requirements and established information systems to disseminate that information to staff. By utilizing a corporate ESH web site, LM Aero—Palmdale employees are able to keep up with legal and other requirements. An extensive training program helps ensure that employees understand legal requirements.
- The aspect and impact identification process of their EMS has added significant awareness of their environmental impacts. Prior to EMS implementation, no accounting system of major environmental impacts existed. In fact, LM Aero – Palmdale’s compliance history demonstrates that prior to EMS implementation in 1992, even regulated impacts were not adequately managed. The analysis of LM Aero – Palmdale’s aspects demonstrates that they are primarily focused on regulated impacts; however, some non-regulated aspects are recognized and therefore should be managed to reduce impacts.
- LM Aero – Palmdale’s procedure for determining whether an aspect has significant impact considers geographic scale of the impact. The impact’s consequence on local, regional, or global ecology is determined. Ranking of significant impacts into low, medium, or high risk demonstrates a greater understanding and awareness of the impacts of LM Aero – Palmdale’s activities.
- LM Aero – Palmdale’s objectives and targets demonstrate commitments to continually improve both regulated and non-regulated environmental aspects. The focus, however, is with regulated aspects. While performance for hazardous waste generation goes beyond regulatory requirements, they have not set objectives in excess of permitted emission standards for air or water. Their targets continue to address areas like hazardous waste and worker safety where significant progress has already been made. They are also establishing objectives in new areas like solid waste disposal, energy and transportation. Prior to EMS implementation in 1992, a system for setting environmental goals did not exist.
- The 6S program and Chemical Control Board are two examples of operational control that make up LM Aero – Palmdale’s EMS. Through the 6S program, they have successfully integrated environmental safety and health priorities into manufacturing activities. The Chemical Control Board establishes programs to manage chemical purchases and uses and plans pollution prevention projects. These programs are consistent with the Environmental Policy and help meet several objectives.

- The EMS has resulted in great improvements in training, internal communication and employee involvement. The Job Hazard Analysis program has improved the quality of information going to employees by providing a “simple summary” of all the hazards of an area and what must be done to protect the worker and the environment. The JHA program helps maintain EHS requirement awareness throughout the workforce as committed in the Environmental Policy.
- The Job Hazard Analysis is an example of an integrated program that meets several objectives. Through the analysis, new environmental aspects and impacts can be identified as well as their risks and significance. The program also communicates valuable information to management and staff enabling them to work in a safer and more responsible manner. The JHA also provides valuable information to ESH staff and contributes to the continual improvement process of their EMS.
- Although required by regulations, LM Aero – Palmdale EMS has improved emergency preparedness by increasing communication between local fire departments and the facility. LM Aero – Palmdale provided several seminars and facility tours to first responders. Their work with emergency response agencies is an example of their commitment to pro-active partnerships with regulatory agencies expressed in the environmental policy.
- Better systems for ensuring regulatory compliance are being utilized with the help of Information Technology (IT). By utilizing a corporate ESH web site, LM Aero—Palmdale employees are able to keep up with legal and other requirements. Also, extensive review and audit programs aim to identify issues early. Root cause analysis and corrective action is required for any identified nonconformance. These system help LM Aero – Palmdale meet their commitment to comply with applicable laws and regulations and meet the yearly objective on zero Notice of Violations.
- LM Aero – Palmdale’s system for review and continual improvement has evolved with the development of their EMS. Prior to EMS implementation senior management was not even aware of the amount of hazardous waste generated by the company. Issues arising from audits and review require that root cause analysis is conducted and corrective action taken. Through this process LM Aero – Palmdale identifies issues and makes corrections in order to continually improve their EMS. Environmental performance and progress towards objectives are also reviewed. New performance objectives are established yearly by senior management.
- Systems implemented by LM Aero – Palmdale to manage both environmental and worker safety aspects are consistent with and support their Environmental Policy and objectives and targets. A clear relationship exists between the commitments expressed in the Environmental Policy, objectives

set to support the policy, and the programs put into process to implement the policy and achieve objectives and targets.

- LM Aero – Palmdale's EMS is primarily focused on minimizing air, water and waste impacts of hazardous materials. Therefore, regulated programs have been the primary focus. Non-regulated areas like solid waste, transportation, and energy are now getting the attention of their EMS.
- Significant environmental performance improvements were measured during the study period. This is especially true for hazardous waste generation. Between 1996 and 2000, total hazardous waste was reduced by 46 percent. When 1991 is used as a baseline, the reduction equals 91 percent.
- A comparison of RCRA and California only hazardous waste indicates that LM Aero – Palmdale has been more successful in implementing pollution prevention activities for RCRA waste than California only waste. Between 1996 and 2000 California only waste has actually increased by 23 percent while employment decreased by 21 percent. RCRA waste during the same period was reduced by 65 percent. Employment figures, while a useful indicator of production activity, does not appear to be the single influence of waste reduction indicators. Other factors, like the implementation of the 6S Program, may also affect hazardous waste generation.
- Percent increases in environmental performance generally declined with time as the availability of high impact projects diminished. Greatest reductions in hazardous waste and VOCs were seen during the first years of EMS implementation and prior to the baseline period of this project. This corresponds to the closing of the Burbank facility, eliminating old technologies and replacing them with less polluting technologies.
- Environmental performance continues to improve as LM Aero – Palmdale targets specific aspects with projects designed to break through technical barriers which have hindered performance improvements. They have established an environmental technologies task force to determine and prioritize pollution prevention projects. In 2001, they set and met an aggressive target to reduce hazardous waste generation by 10 percent, as compared to 2000.
- The 6S Program measures and awards adherence to best practices in health, safety and environmental protection as well as efficiency. The level of performance in the 6S program as measured by level of award (bronze, silver, gold, or platinum) has improved since its inauguration. Platinum, the highest level, increased from 4 areas in 1999 to 22 areas in 2000. Areas receiving only satisfactory status were reduced from 29 in 1999 to 8 in 2000.

- Days Away Case Rate (DACR) is LM Aero – Palmdale's measure of worker health. A 0.88 injury per 100 employees DACR in 2000 was the lowest rate over the study period. In 1995, the year prior to the first baseline year DACR was 2.33 per 100 employees. The 2000 figure represents a 66 percent reduction from 1995 levels. LM Aero – Palmdale set a 2001 objective to achieve a lost work days incident rate reduction of 10 percent compared to 2000. A reduction of 50 percent was actually achieved.

## **5.2 Objective 2      Environmental Information**

- Public outreach and communication is an important part of LM Aero – Palmdale's EMS. Greater environmental information has been provided to the public through increased stakeholder involvement (Community Stakeholder Environmental Roundtable and the EMS Pilot Project). Some environmental information is provided on LM Aero – Palmdale's web site.
- LM Aero – Palmdale has also become more involved in community environmental issues by supporting local schools and hosting household toxic roundup days and pollution prevention fairs. These activities go beyond the parameters in their environmental policy by extending pro-active partnerships to the community.
- LM Aero – Palmdale has increased information to emergency response agencies and is exploring the use of Geographical Information Systems to further enhance information to these agencies.

## **5.3 Objective 3      Economic Incentives and Barriers to EMS Implementation**

- Although difficult to specifically attribute to its EMS, LM Aero – Palmdale has reduced its annual environmental program costs (i.e., costs for waste disposal, air and water treatment systems, laboratory analysis, and environmental fees and taxes) by over \$1 million between 1992 and 1999. These costs went from \$2,157,000 in 1992 to \$1,057,000 993,000 in 1999 for over total savings of \$7,249,000

## **5.4 Objective 4      Challenges and Successes of EMS Implementation**

- LM Aero – Palmdale was highly motivated to establish an EMS in 1992. Environmental fines of \$2.7 million and emerging customer requirements helped establish corporate and management commitment for EMS implementation. This commitment was translated into personnel and resources needed to create a successful EMS.
- LM Aero – Palmdale ability to integrate the EMS and its philosophies into every aspect of their business has greatly contributed to its success. Stressing that environmental health and safety is everyone's responsibility



has helped make the integration successful. The Environmental Policy firmly establishes LM Aero - Palmdale's commitment to integration. Programs like 6S, Chemical Control Board, and the JSF demonstrate successful integration.

- Improvements in environmental information to the public have primarily occurred through the involvement of stakeholder groups. These groups are given the most complete and recent information on environmental issues; however, they meet infrequently. Limited environmental information has been shared through the Internet and this information is now dated. The type of information generated by LM Aero – Palmdale's EMS is extensive and relevant to the public. Sharing this information in a timely manner and in a way that is most accessible is a challenge.

**5.5 Objective 5** Evaluate the relationship between an EMS and a pollution prevention program.

- Pollution Prevention has been the guiding principle and foundation of their EMS since its inception. What LM Aero – Palmdale's EMS has demonstrated is that the EMS and pollution prevention are highly complementary and that the elements of an EMS like Environmental Policy, aspect/impact identification, objective setting, measurement, review and continual improvement all help performance of pollution prevention activities. Pollution prevention has been a focus of LM Aero – Palmdale's EMS and has successfully improved environmental protection by elimination of hazardous waste and air emissions.

**5.6 Objective 6** Determine whether and how integrating occupational safety and health (OSH) programs into an EMS can improve both environmental and worker protection.

- Health and safety has been successfully integrated into LM Aero – Palmdale's EMS. This has improved both worker and environmental protection. The 6S program and Job Hazard Assessment are examples of this integration.

## **6.0 Conclusions of the LM Aero – Palmdale Pilot Project**

The data collected and observations made during the LM Aero – Palmdale pilot project demonstrates improved environmental protection as a result of EMS implementation. A lack of commitment towards environmental protection and a lack of awareness and understanding of environmental impacts and regulation characterize the period prior to EMS implementation. During this period, LM Aero operations contributed to a Superfund site in Burbank and they were fined \$2.7 million for environmental and worker safety violations. Since implementing their EMS in 1992, LM Aero – Palmdale has experienced a fundamental shift in the culture of the organization to one committed to continual improvement in

environmental and worker protection. This commitment is demonstrated in their Environmental Policy as well as their activities and environmental performance.

LM Aero – Palmdale has achieved greater environmental protection through the development and implementation of an EMS that operates as a coordinated and integrated system. The relationships between Environmental Policy, impact identification, objectives and targets, program implementation, review, and continual improvement are clearly established. LM Aero – Palmdale has successfully integrated the Environmental Policy into all aspects of their business by developing operational controls, training and communication programs, and pollution prevention programs that incorporate the common and overlapping elements of their business activities.

A greater amount of information on the environmental and worker impacts, commitments and performance is generated through LM Aero – Palmdale's EMS. LM Aero – Palmdale has willingly shared this information with stakeholder groups and, to a limited extent, through a web site. Direct involvement with emergency response agencies resulted in agencies receiving greater information on the type of substances and risks that they might face when responding to emergencies. These improvements represent only a fraction of the potential information benefits to the public as a result of EMS implementation. Greater use of information technology like the Internet or geographic information systems will further improve the information provided to the public.

Integrating environmental health and safety into a single EMS has benefited both environmental and worker protection. Common issues and impacts have allowed LM Aero – Palmdale to establish programs with overlapping environmental and worker safety goals.

Pollution prevention and EMS are not mutually exclusive endeavors but are instead highly complementary approaches to environmental protection. While pollution prevention objectives can be achieved without the structure of an EMS, the systematic elements of an EMS can enhance a pollution prevention program.

**Table 1. Significant Aspects and Impacts for LM Aero-Palmdale<sup>1</sup>**

Aspect	Regulated Impacts				Non-Regulated Impacts					
	Air	Water	Haz. Material or Waste	Health & Safety (other)	Air	Water	Solid Waste	Energy	Material/Resource Input	Other
Wastewater Discharges		X	X							
Air Emissions	X				X					
Hazardous Wastes			X	X						
Chemical Management (Approval and Cribs)	X		X	X						
Drinking Water Use		X				X				
Aboveground Storage Tanks		X	X							
Storm Water		X								
Non-Hazardous Industrial Wastes			X				X			
Underground Storage Tanks	X		X							
PCBs and Asbestos	X		X	X						
Toxic Substances (TSCA/Prop 65)	X	X		X						
Contractor Management	X	X	X	X	X	X	X	X		X
Customer Requirements	X	X	X	X			X			
Solid Waste						X	X			

<sup>1</sup> Data sources: University of North Carolina National Database Report, EMS Design Table 2: Activities, Aspects and Impacts; and Design Update Section 4.

**Table 1. Significant Aspects and Impacts for LM Aero-Palmdale<sup>1</sup> (continued)**

Aspect	Regulated Impacts				Non-Regulated Impacts					
	Air	Water	Haz. Material or Waste	Health & Safety (other)	Air	Water	Solid Waste	Energy	Material/Resource Input	Other
Soil and Groundwater Contamination		X	X	X						
Ozone Depleting Substances	X		X		X					
Wetlands/Endangered Species/Wildlife		X								
Real Estate Transactions			X							
Land Use/Other Resource Use									X	
Energy Consumption					X			X	X	
Prevention of Pollution			X		X	X				
Spills and Incidents	X	X	X	X						
Chemical Inventory and Releases (SARA)	X	X	X							

<sup>1</sup> Data sources: University of North Carolina National Database Report, EMS Design Table 2: Activities, Aspects and Impacts; and Design Update Section 4.

**Table 2. Objectives and Targets for LM Aero-Palmdale<sup>2</sup>**

Objective	Target	Status	Regulated		Non-Regulated
			Meets	Beyond	
Obtain OSH Voluntary Protection status	July 1999	Obtained 1999		X	
Corporation Validate ISO 14001 Conformance	June 2000	Corporate validation 2000			X
Achieve a 10% reduction in production-related hazardous waste compared to 2000	December 2001	9.5% reduction		X	
Achieve an occupational lost workday rate reduction of 10% compared to 2000	December 2001	50% reduction		X	
Achieve Zero Notice of Violations	1999, 2000, 2001	Achieved 1999 and 2000. In progress for 2001	X		
Complete 6S projects in the six ESH Buildings	July 2000	Completed six projects			X
Achieve Lean Enterprise Goal for Hazardous Waste	December 1999	Met goal		X	
Reduce Solid Waste Disposal and Cost 10% (over 1999)	December 2000	5 percent increase			X
Ensure SARA TRI Releases stay below thresholds for 5 <sup>th</sup> consecutive year	December 2000	Stayed below threshold		X	
Establish environmental baseline and targets for energy/ transportation related aspects	December 2000	No change			X
Continue Chemical Control Board P2 targets to reduce waste disposal 10% (over 1999)	December 2001	Deleted goal. Replaced with common technologies task force. See next objective.		X	
Develop and implement a common environmental technologies task force to determine and prioritize P2 projects	December 2001	Task force implemented		X	
Manage worker's compensation programs to maintain a zero cost growth in spite of increasing provider and indemnity rates.	December 2001	73% increase due to one expensive non occupational claim		X	

<sup>2</sup> Data sources: University of North Carolina National Database Report, EMS Design Table 5: Planned Dates of Objectives and Targets; and Design Update Section 6.

**Table 3. Environmental Performance Measure for LM Aero-Palmdale<sup>3</sup>**

Indicator	Baseline Data						Update Data			
	1996		1997		1998 (adopted EMS)		1999		2000	
	Non-Normalized	Normalized 5441 emp.	Non-Normalized	Normalized 5755 emp.	Non-Normalized	Normalized 5625 emp.	Non-Normalized	Normalized 5090 emp.	Non-Normalized	Normalized 4256 emp.
Total hazardous waste disposal (RCRA and State)	1,084,000 lbs.	199 lbs per employee	988,000 lbs.	172 lbs per employee	896,000 lbs.	159 lbs per employee	716,000 lbs.	141 lbs per employee	628,000 lbs.	147 lbs. per employee
Production related hazardous waste	701,889 lbs.	129 lbs. per employee	615,785	107 lbs. per employee	635,625	113 lbs. per employee	540,000	106 lbs per employee	528,000	124 lbs per employee
RCRA production hazardous waste	403,722 lbs.	74.2 lbs. per employee	325,733 lbs.	56.6 lbs. per employee	280,687 lbs.	49.9 lbs. per employee	213,200 lbs.	41.9 lbs. per employee	140860 lbs.	33 lbs. per employee
California production hazardous waste	298,167 lbs.	55 lbs. per employee	290,052 lbs.	50 lbs. per employee	354,938 lbs.	63 lbs. per employee	326,800 lbs.	64 lbs. per employee	387,140 lbs.	90 lbs. per employee
VOC emissions	41,847 lbs.	8 lbs. Per employee	35,691 lbs.	6 lbs. Per employee	41,006 lbs.	7 lbs. Per employee	37,107 lbs.	7 lbs. Per employee	49,286 lbs.	12 lbs. per employee
Solid Waste disposal	855 tons	314 lbs. per employee	934 tons	325 lbs. per employee	1, 542 tons	548 lbs per employee	1,057 tons	415 lbs. per employee	1,104 tons	518 lbs per employee
6S Program (indicator added in 1999)	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	4 plat. 4 gold 7 silver 14 brnz 29 satis.	na	22 plat. 5 gold 5 silver 10 brnz 8 satis.	na
Days Away Case Rate	Not measured	1.28 injuries per 100 employee	Not measured	1.23 injuries per 100 employee	Not measured	0.91 injuries per 100 employee	Not measured	1.18 injuries per 100 employee	Not measured	0.88 injuries per 100 employee

<sup>3</sup> Data sources: University of North Carolina National Database Report, Baseline Table 2: Environmental Performance Indicator Values; and Update Table 4: Environmental Performance Indicator Values.

**Table 4. Environmental Performance Compared to Regulatory Requirements for LM Aero-Palmdale<sup>4</sup>**

Regulatory Requirement			Objective and Target	Environmental Performance Measure				
Permitted Emission	Regulation	Permit limit		1996	1997	1998	1999	2000
VOC	Local air requirement	114 tons/yr.	Maintain compliance	<21 tons	<18 tons	<20 tons	18.5 tons	24.6 tons
Cadmium	Local pretreatment Program	0.02 mg/l 15 mg/l 1997 and before	Maintain compliance	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
Chromium	Local pretreatment Program	0.42 mg/l 10 mg/l 1997 and before	Maintain compliance	0.022 mg/l	0.022 mg/l	<0.04 mg/l	0.023 mg/l	0.0053 mg/l
Copper	Local pretreatment Program	0.51 mg/l 15 mg/l 1997 and before	Maintain compliance	0.17 mg/l	0.12 mg/l	0.083 mg/l	0.053 mg/l	0.013 mg/l
Lead	Local pretreatment Program	0.11 mg/l 40 mg/l 1997 and before	Maintain compliance	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.005 mg/l
Nickel	Local pretreatment Program	0.61 mg/l 12 mg/l 1997 and before	Maintain compliance	<0.04 mg/l	<0.04 mg/l	<0.04 mg/l	<0.01 mg/l	<0.01 mg/l
Silver	Local pretreatment Program	0.07 mg/l 5 mg/l 1997 and before	Maintain compliance	0.034 mg/l	0.024 mg/l	0.011 mg/l	0.027 mg/l	<0.01 mg/l
Zinc	Local pretreatment Program	0.40 mg/l 25 mg/l 1997 and before	Maintain compliance	0.25 mg/l	0.21 mg/l	0.33 mg/l	0.25 mg/l	0.035 mg/l
CN	Local pretreatment Program	0.18 mg/l no permit limit prior to 1998	Maintain compliance	NA	NA	<0.025 mg/l	<0.025 mg/l	<0.025 mg/l

<sup>4</sup> Data sources: University of North Carolina National Database Report, Baseline Table 4: Regulatory Requirements; Update Table 5: Change in Regulatory Requirements; EMS Design Table 5: Planned Dates of Objectives and Targets; and Design Update Section 6.

**Table 5. Compliance Information for LM Aero - Palmdale<sup>5</sup>**

Infraction	Historic	Baseline			Update	
		1996	1997	1998	1999	2000
Major Violation	Nearly \$3 million in fines 1989 and 1990; see note below.	0	0	0	0	0
Significant (Moderate) Violation	0	0	0	0	0	0
Minor Violation	0	0	0	0	0	0
Non-Compliance	0	0	0	a. Chrome exceedence LA Co. Sanitation, no fine. b. Coliform in well by DHS, no fine.	0	a. Sulfur in discharge waste water, LA Co. Sanitation, no fine.
Potential Non-Compliance	0	0	0	0	0	0

Note: Most EPA enforcement policies explicitly utilize “Major, significant (moderate) and minor” classifications to determine the appropriate enforcement response to a given violation. A Non-compliance is an infraction either discovered by the regulated party or environmental agency that does not lead to violation. A Potential Non-compliance is a situation that is discovered and corrected before a violation could occur.

Note: 1989 South Coast AQMD \$1 million; 1989 OSHA \$1.5 million; 1990 California DTSC \$50,000; 1990 US EPA \$400,000

<sup>5</sup> Data Sources: University of North Carolina National Database Report, Baseline Report 3: Violation Report; Baseline Report 4: Non-compliance/Potential Non-Compliance Report; and Update Report 5: Violation Report; and Update Report 6: Non-compliance/Potential Non-Compliance Report.



**Table 6. Environmental Information Type and Availability to Public for LM Aero-Palmdale<sup>6</sup>**

Information Subject	Legal Reporting Requirement		Location of Public Information					
	Yes	No	Web site	Public Relations Dept.	Newsletter	Annual Report	Environmental Agency	Other
EMS Policy		X	X					
EMS Env. Aspects		X						
EMS Env. Impacts		X						Stakeholder group
EMS Objectives and Targets		X						Stakeholder group
Operation and Procedures		X						
Compliance information	X						X	Stakeholder group
Haz. waste generation	X		X				X	Stakeholder group
Air emissions	X						X	Stakeholder group
Waste Water discharge	X						X	
Resource use: energy		X						
Resource use: water		X						
Resource use: materials		X						
Solid Waste		X						Stakeholder group
TRI			X					
Community Right to Know	X						X	
Prop. 65	X						X	
Health & Safety		X	X					

<sup>6</sup> Data Sources: California Supplemental Protocols

